Patent
Attorney's Docket No. **RIC-96-153**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
Viet Le et al.	)	Group Art Unit: 2633
Application No.: 08/923,461	)	Examiner: R. Sedighian
Filed: September 4, 1997	)	
For: METHOD AND SYSTEM FOR MODULAR MULTIPLEXING AND AMPLIFICATION IN A MULTI-CHANNEL PLAN	)	

TRANSMITTAL FOR APPEAL BRIEF

U.S. Patent and Trademark Office
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Arlington, Virginia 22202

Sir:

Transmitted herewith in triplicate is an Appeal Brief in support of the Notice of Appeal filed October 14, 2003.

Please charge the fee of ☐ $165.00 ☒ $330.00 to Deposit Account No. 13-2491.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17, 1.20(d) and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 13-2491. This paper is submitted in triplicate.

Respectfully submitted,

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Date: December 15, 2003

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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BRIEF FOR APPELLANTS

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Arlington, VA 22202

Sir:

This appeal is from the decision of the Primary Examiner dated July 14, 2003 finally rejecting claims 81 and 82, which are reproduced as an Appendix to this brief, and in support of the Notice of Appeal, filed October 14, 2003.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is MCI Communications Corporation.

II. RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, there are no other appeals or interferences known to the Appellants, the Appellants' legal representative, or the above-noted assignee that will directly affect or be directly affected by, or have a bearing on, the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 81 and 82 are currently pending in the application. Claims 81 and 82 are the subject of the present appeal.

IV. STATUS OF AMENDMENTS

No amendments after-final have been filed in the application.

V. SUMMARY OF THE INVENTION

The present invention relates to a system for equalizing optical gain across a set of channels within an operating window of a fiber communication network (see pg. 9, lines 5-10 and pg. 10, line 31 through pg. 11, line 2). In the system, the operating window is divided into subwindows (e.g., groups of channels), with optical signals in each subwindow being optically

amplified separately and in parallel by multiple optical line amplifers (pg. 9, lines 5-10). The system for equalizing optical gain includes a coarse wavelength division multiplexing/demultiplexing (CWDM) unit (403), multiple fine wavelength division multiplexers (405, 407), multiple fine wavelength division demultiplexers (404, 406), and multiple optical line amplifiers (210, 220, 230, 240). Coarse wavelength division multiplexing/demultiplexing unit (403) multiplexes/demultiplexes optical signals into subwindows depending upon wavelength (pg. 13, lines 24-26). Fine wavelength division multiplexers (405, 407) multiplex optical signals from channels into subwindows of the operating window (see FIG. 4 and pg. 14, lines 1-2). Fine wavelength division demultiplexers (404, 406) demultiplex optical signals from subwindows of the operating window into channels (see FIG. 4 and pg. 14, lines 1-2). Each of the multiple optical line amplifiers (210, 220, 230, 240) amplifies separately each respective subwindow of the operating window (pg. 10, line 31 through pg. 11, line 2).

As shown in FIG. 4, CWDM unit 403 divides the optical signals in a set of multiple channels into multiple subgroups of optical signals that each corresponds to a different subwindow of the operating window (pg. 14, lines 3-7). Fine WDM units 404-407 further divide the multiple subgroups of optical signals by wavelength into channels (pg. 14, lines 9-12). Respective optical line amplifiers (210-240) may amplify separately each respective subwindow so as to substantially equalize gain across all of the channels in the operating window (pg. 10, line 31 through pg. 11, line 2).

VI. ISSUES

Whether claims 81 and 82 are properly rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,909,295 (hereinafter "LI") in view of U.S. Patent No. 5,801,858 (hereinafter "ROBERTS).

VII. GROUPING OF CLAIMS

For purposes of this appeal, Appellants' claims 81 and 82 stand or fall together.

VIII. ARGUMENTS

A. The rejection of claims 81 and 82 under 35 U.S.C. § 103(a) as unpatentable over LI in view of ROBERTS should be REVERSED.

Claims 81 and 82 stand finally rejected under 35 U.S.C. §103(a) as being unpatentable over LI in view of ROBERTS. Appellants have chosen claim 81 as representative of the group including claims 81 and 82.

A proper rejection under 35 U.S.C. §103 requires that a *prima facie* case of obviousness be established. To establish a *prima facie* case of obviousness, a number of criteria must be met. As a first criteria for establishing a *prima facie* case of obviousness, the prior art reference (or references when combined) cited by the Office Action must teach or suggest all of the claim features. In re Vaeck, 947 F.2d 488, U.S.P.Q.2d 1438 (Fed. Cir. 1991). See M.P.E.P. § 2143. A further requirement for establishing a *prima facie* case of obviousness is that there must be some

reason, suggestion, or motivation to combine reference teachings. In re Vaeck, *supra*. Appellants submit that the Final Office Action fails to satisfy either of the above requirements for establishing a *prima facie* case of obviousness.

The final Office Action admits (pg. 3) that LI does not disclose "a plurality of first and a second optical line amplifiers [sic] for amplifying the different respective subgroups of first and second set of optical signals." The final Office Action, however, cites ROBERTS (pg. 3) as allegedly disclosing "an optical communication system (fig. 7C) for bi-direction [sic] transmission and reception (Tx, Rx, fig. 7C) of a plurality of optical signals of different wavelengths (Red and Blue, fig. 7C) that are amplified by different optical line amplifiers (col. 9, lines 63-67)." The final Office Action further cites ROBERTS (pg. 3) as allegedly disclosing that "optical amplifiers can be configured to substantially equalize gain across the set of channels (col. 7, lines 3-30)." Appellants traverse and submit that ROBERTS does not disclose or suggest an "operating window comprising a first set of subwindows traveling in a first direction and a second set of subwindows traveling in a second direction, the first set of subwindows comprising different channels of the set of channels than the second set of subwindows, wherein each subwindow of the first and second set of subwindows comprises a plurality of channels from the set of channels," "a first plurality of optical line amplifiers, each of the first plurality of optical line amplifiers configured to amplify a different respective subwindow of the first set of subwindows traveling in the first direction," and "a second plurality of optical line amplifiers, each of the second plurality of optical line amplifiers configured to amplify a different respective

subwindow of the second set of subwindows traveling in the second direction, wherein the first and second plurality of optical line amplifiers are configured to substantially equalize gain across the set of channels within the operating window," as recited in claim 81.

In contrast to claim 81, ROBERTS discloses (column 5, line 45 through column 7, line 21) the use of a bi-directional amplifier 15 for amplifying optical signals traveling in opposite directions across a single optical fiber 1 (see FIG. 1B; column 6, lines 63-66). Details of the bi-directional amplifier 15 are shown in FIG. 3, and described in column 6, line 63 through column 7, line 21. Bi-directional amplifier 15 includes a wavelength splitter 21 that splits traffic in the "blue" and "red" wavelength bands over fibers 17 and 19 for amplification, and recombines the split traffic for transmission across fiber 1 (see FIG. 3; column 7, lines 3-7). As described, the bi-directional amplifier 15 uses a first gain length 27 for amplifying "red" wavelength signals traveling in one direction across optical fiber 1 and a second gain length 31 for amplifying "blue" wavelength signals traveling in a second direction across optical fiber 1. As disclosed in column 9, lines 23-34, FIGS. 7A, 7B and 7C illustrate more sophisticated bi-directional amplification schemes in which there is more than one signal traveling in each direction on optical fiber 1. ROBERTS, thus, discloses the use of a bi-directional amplifier for amplifying optical signals traveling in two different directions. ROBERTS, however, does not suggest or disclose separate *sets* of optical line amplifiers that amplify different subwindows traveling in different directions. ROBERTS, thus, does not suggest or disclose "a first plurality of optical line amplifiers, each of the first plurality of optical line amplifiers configured to amplify a different respective

subwindow" traveling in a first direction or "a second plurality of optical line amplifiers, each of the second plurality of optical line amplifiers configured to amplify a different respective subwindow" traveling in a second direction, as recited in claim 81.

Additionally, ROBERTS does not suggest or disclose, "wherein the first and second plurality of optical line amplifiers are configured to substantially equalize gain across the set of channels within the operating window," as is further recited in claim 81. The final Office Action, on pg. 4, points to column 7, lines 3-30 of ROBERTS as allegedly disclosing this feature. Column 7, lines 3-30 of ROBERTS discloses:

> As shown in FIG. 3, the optical signals traveling within the central section of optical amplifier 15 are grouped in two bands, each for a direction of transmission in this example. The traffic in the Red and Blue bands is physically separated on fibers 17 and 19 using a first three-port WDM splitter 21. Signals on fibers 17 and 19 are then recombined by a second three-port WDM splitter 23. As a result, the amplifier has two peripheral gain spans 25 and 29, and two central gain lengths 27 and 31. The signals travel in both directions at the periphery of the amplifier in the gain spans 25 and 29 and in one direction in the central lengths 27 and 31. Isolators 33, 35, and 37 are also provided and oriented so as to obtain bidirectional operation between the bands. Because the "Red" and "Blue" gain lengths are spatially separated, separate power control per direction is preferably used, through separate saturation of gain and through control of separate pump powers. Embodiments of the amplifier module 15 where the signals travel in the same direction may also be designed, in which case separate or common control per band may be used.
>
> This architecture significantly reduces the effect of gain tilt between the two bands and multi-path interference from imperfect isolation of the two splitters. By using different directions in the central region of the EDFA, and also two spatially separated bands, the isolation requirements in the WDM splitters 21 and 23 are achievable. In addition, by separating the bands within the amplifier and providing gain stages outside the separation, the noise figure and output power penalty due to the losses of the WDM couplers are reduced.

ROBERTS, thus, discloses the use of the two different gain lengths 27 and 31 for reducing "the effect of gain tilt between the two bands." As one skilled in the art will recognize, and as disclosed in column 6, lines 18-25 of ROBERTS, "gain tilt" is a change in gain that corresponds to a change in amplifier input power as a function of wavelength. The reduction of gain tilt as disclosed in ROBERTS, thus, involves the minimization of changes in gain due to changes in input power. ROBERTS, though, does not disclose, or even suggest, equalizing gain across a set of channels within an operating window, as recited in claim 81. One skilled in the art will recognize that "gain" represents the ratio of output optical power to input optical power. Thus, equalization of gain across a set of channels involves equalizing the ratio of output to input optical power across the set of channels. Equalizing gain, therefore, is entirely different than "reduction of gain tilt" as disclosed by ROBERTS. Reduction of gain tilt minimizes a change in gain due to a change in input power, whereas equalization of gain equalizes the ratio of output power to input power. ROBERTS, thus, does not disclose, or even suggest, optical line amplifiers "configured to substantially equalize gain" as recited in claim 81.

The final Office Action further appears, at page 3, to be taking Official Notice, alleging that "it is well known that optical line amplifiers can be placed anywhere along different transmission paths to restore the signal to a desired level." Appellants respectfully submit that the Office Action's apparent Official Notice does not address the features recited in claim 81, which recites that separate groups of optical line amplifiers may be used in a system for

equalizing gain across a set of channels within an operating window of a fiber communication network and for amplifying different respective subwindows of first and second sets of subwindows that travel in different directions in a coarse wavelength division multiplexing/demultiplexing and fine wavelength division multiplexing/demultiplexing scheme. Appellants, thus, respectfully submit that the Office Action's oversimplification of the features of claim 81 does not address the relevant features recited in claim 81.

In view of the above remarks, Appellants respectfully submit that the disclosure of ROBERTS does not supply the features of claim 81 that are admitted by the Office Action as not being disclosed by LI. For at least this reason, Appellants submit that the Office Action has failed to establish a *prima facie* case of obviousness.

Furthermore, Appellants respectfully submit that the Office Action has not provided a sufficient reason, suggestion, or motivation for combining the teachings of ROBERTS with the teachings of LI. The Office Action alleges (at pg. 4) that "it would have been obvious to a person of ordinary skill in the art at the time of invention to incorporate a plurality of optical line amplifiers such as the ones of Roberts along the respective optical fiber lines in the multiplex/demultiplex transmission system of Li in order to boost the respective subgroup of optical signals that are attenuated during the transmission." The Office Action, thus, asserts that, since ROBERTS teaches the use of optical amplifiers for amplifying optical signals, that it would have been obvious to combine that broadly stated teaching to achieve the specifically claimed amplification of the multiple subwindows of the bi-directional signal traffic.

As further discussed above, ROBERTS merely discloses the use of a single bi-directional amplifier for amplifying optical signals traveling in two different directions across a single optical fiber, and not the use of first and second *sets* of *multiple* amplifiers, with each amplifier of the sets of multiple amplifiers amplifying a "different respective subwindow" of the operating window. Appellants, therefore, respectfully submit that it would not have been obvious to combine the teachings of ROBERTS, which merely discloses use of a single bi-directional amplifier for amplifying optical signals traveling in two different directions across a single optical fiber, with the teachings of LI, to produce the claimed amplification of "different respective subwindows," as recited in claim 81.

In summary, the final Office Action has not established a *prima facie* case of obviousness for combining LI and ROBERTS to allegedly produce the features recited in claim 81. Appellants, therefore, respectfully request that the rejection of claims 81 and 82 under 35 U.S.C. §103(a) be REVERSED.

IX. CONCLUSION

For at least the foregoing reasons, it is respectfully requested that the Examiner's rejection of claims 81 and 82 under 35 U.S.C. §103(a) be REVERSED.

Respectfully submitted,

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Date: December 15, 2003

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APPENDIX

THE APPEALED CLAIMS

The claims on appeal are as follows:

81. A system for equalizing optical gain across a set of channels within an operating window of a fiber communication network, comprising:

a coarse wavelength division multiplexing/demultiplexing unit configured to support bi-directional optical signal traffic within the operating window, the operating window comprising a first set of subwindows traveling in a first direction and a second set of subwindows traveling in a second direction, the first set of subwindows comprising different channels of the set of channels than the second set of subwindows, wherein each subwindow of the first and second set of subwindows comprises a plurality of channels from the set of channels;

a plurality of fine wavelength division multiplexers configured to support uni-directional traffic comprising the first set of subwindows;

a plurality of fine wavelength division demultiplexers configured to support uni-directional traffic comprising the second set of subwindows;

a first plurality of optical line amplifiers, each of the first plurality of optical line amplifiers configured to amplify a different respective subwindow of the first set of subwindows traveling in the first direction; and

a second plurality of optical line amplifiers, each of the second plurality of optical line amplifiers configured to amplify a different respective subwindow of the second set of subwindows traveling in the second direction,

wherein the first and second plurality of optical line amplifiers are configured to substantially equalize gain across the set of channels within the operating window.

82. The system of claim 81, wherein the first direction is opposite the second direction.